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Prognostic Value of Higher Secondary Examination of Delhi

BY

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FOREWORD

The present study "Prognostic Value of Higher Secondary Examination of Delhi" is the synopsis of a thesis presented to the University of Delhi in fulfilment of the requirement for the Ph.D. Degree in the Faculty of Education in 1954. The study was completed under my guidance and supervision.

The investigation was concerned with the predictive value of the Higher Secondary examination on the strength of which a student may enter the University of Delhi. In other words, it investigated the extent to which success in that examination is an augury of success at the University. So far no such study on the prognostic value of a University Entrance examination seems to have been made in India, though much work has been done on other aspects of examination.

To-day all attention is focussed on the prognostic value of tests for educational and vocational guidance. Many more scientific studies are needed in this field. Basic research has already been started and it is hoped that with the development of better tools and techniques the research workers will be able to indicate the right lines along which such educational and vocational guidance may be given to our students.

I believe that the present study will serve the purpose of stimulating interest in prognostic studies which have a great significance for educational reorganization that is now taking shape in this country.

Central Institute of Education,
April, 1955.

A. N. Basu
Principal

PROGNOSTIC VALUE OF HIGHER SECONDARY EXAMINATION OF DELHI

SUMMARY OF THE STUDY

Introduction :

In Free India, education is no longer the birth-right of a privileged few, as before. It is rapidly spreading to the masses and "free, compulsory, universal education" is the slogan of the day. As such, various kinds of educational evaluation are necessary and almost indispensable to assess different individuals for diagnostic and prognostic analyses so that they may be guided along the right channels, in the proper educational and vocational fields. Thus, in India, these evaluating instruments must be developed and perfected so that they may be used along with the information regarding the personal characteristics and school achievement, in predicting the future of the pupils concerned. These predictions are specially invaluable at the time of transfer of candidates from primary to secondary school and from secondary school to higher institution when each individual is required to choose school or college subjects according to his or her own intelligence, interest and aptitude.

An extremely interesting and epoch-making experiment had been launched in Delhi in the year 1944, after the recommendation of the Central Advisory Board of Education, in the shape of the introduction of the Higher Secondary examina- and a three-year degree course thereby making the entire school course one of eleven years. In the years 1944 and 1945 the above examination was held after one year's study after the tenth class. From 1946, the full-fledged programme came into force. The examination is now being held after a three years' study in the higher secondary stage which begins with class nine.

Presently, in Delhi, selection of students (from the State of Delhi) to the different degree courses in the university is made with the help of the Higher Secondary examination held by the Board of Higher Secondary Education, Delhi or the Qualifying examination, held by the University of Delhi. These are external examinations. No standardised Intelligence or Achievement tests are in use at the moment for the purpose.

Purpose of the Enquiry :

In the different educational quarters in the country, two schools of opinion have thus come into existence one favouring the above; the other, the older type of High

School examination, providing a ten years' course at school followed by a two-year Intermediate course and then two more years of the degree course. But it is very convincing both from the psychological and academic points of view that a stay of one additional year at the secondary school has far reaching results on the mental and emotional development of an adolescent boy or girl. The purpose of this newly set up Higher Secondary examination is two-fold. It not only tests the attainment of pupils at the completion of an integrated course of secondary education but also opens an avenue to university education for the successful candidates in this examination. Thus, it selects students from among many for the next higher stage in education. This external examination which is held after one additional year at the secondary school is not only expected to fulfil and test all the psychological and academic outcome of secondary education but also to be a valid predictor of the degree of success in the university studies, as the marks obtained in the Higher Secondary examination serve as the selective factor for entrance to the University of Delhi. Therefore, it was thought opportune to investigate the predictive value of the Higher Secondary examination on the strength of which students are now being admitted to graduation courses, in the hope of ascertaining how far the promise shown at the above examination at the conclusion of secondary education is fulfilled by subsequent performance at the Degree examination of the University of Delhi. and to discover possible lines on which the Higher Secondary examination may be modified and reformed so that it may become a more accurate instrument of evaluation in so far as its value as a means of predicting college success is concerned.

Scope of the Enquiry :

For the purpose, the following data were collected. Names and roll numbers of the successful candidates in the higher secondary examinations during the years 1944 to 1947 (both inclusive), who immediately proceeded for the degree courses and completed the examinations after a regular study of three years during 1949 to 1952 (both inclusive), were listed, after scrutinising all the application forms for the admission to the degree examinations in the said years and their Degree examination marks (subjectwise) recorded from the office of the Registrar, University of Delhi. The aforesaid candidates were traced back, their names and roll numbers checked from the Board of Higher Secondary Education, Delhi; and at the same time, their Higher Secondary examination marks collected subjectwise. In order to make a parallel and a comparative study with the above sets of candidates, marks in the Qualifying and Degree examinations were also collected of the successful candidates in the Qualifying examinations of the same years, who also completed their Degree examinations after a regular study of three years.

Other predictive measures apart from university entrance examination marks were also considered, namely, school marks, chronological age and teacher's remarks. School marks unlike public examination marks are said to be a good indicator of pupils' attainments, as in school pupils react to stimuli under more or less natural surroundings and not under strained examination conditions. The great advantage of average school marks is that they are compiled over years by many different people and are likely to give a reliable judgment. The teacher's estimate is also of great value in assessing a student. His assessment of personality of his students which cannot be checked by school or public examination marks may also prove valuable in estimating their future success. The social sense, a great motivating factor in shaping an individual for success in life, only develops with the growing age of the child. Thus, chronological ages of the higher secondary candidates during 1946-1949 were taken into consideration as an additional measure for prediction to find the probable optimum age for success in the degree examination.

The average school marks for the period of three years were not available, as all the schools did not have records for all the years. Only school marks of 144 candidates of the total number who passed the Higher Secondary examination in the year 1946 were collected from their respective schools. It is not the tradition of schools to record teachers' estimates of their pupils. Therefore, college teachers' estimates of the final year students of 1952 were collected not in the form of college marks, but by means of a questionnaire issued to the professors to rate their students on ten items on a five point rating scale. Only 204 questionnaires were properly and completely answered. The ten items are mental capacity, adjustment to the course, drive for graduation, industry, capacity for assuming responsibility, capacity to do independent work, knowledge of the English language. skill in taking down notes, knowledge of how to study for an examination, and knowledge of how to write an examination. If it is found from the present investigation that college teachers' estimates of their students are in keeping with their degree examination results, it can also be assumed that school teachers' estimates would prove more valuable for the purpose of prediction of their future status as there is a more personal contact between the educator and the educand.

The following number of students came within the scope of the present enquiry :

Years of stay in the University	Number of students included in the study who having passed	
	Higher Secondary Examination appeared for Degree Examination	Qualifying Examination appeared for Degree Examination
1944—1947	96	134
1945—1948	101	167
1946—1949	239	182
1947—1950	299	150
1948—1951	401	150
1949—1952	506	203

Procedure

As the present problem was concerned solely with the predictive value of the Higher Secondary examination of Delhi in forecasting success in the Degree examination, the investigator has mostly employed the technique of linear regression, bivariate or multivariate, according to the number of variables involved in the process of prediction.

In dealing with the marks of students, two distinct groups of successful candidates of the Higher Secondary and Qualifying examinations have been maintained throughout the study and even in each group the marks of students gained in the B.A. (Pass), B.Sc. (Pass), B.A (Hons.) and B.Sc. (Hons.) examinations were studied separately for each year.

In order to study the distribution of marks, frequency distribution tables of these were made, and again these were graphically illustrated. Where it was necessary to find out whether the distribution of marks was changing from year to year, the X^2 Test for Homogeneity was applied. Since only the marks of students passing the University Entrance examinations and joining the university were taken into account, the distribution of marks, being of a truncated nature, was not expected to be of the normal type. However, statistical tests based on normal theory were used, because these were accurate enough for practical purposes. The comparison of marks of the University Entrance and Degree examinations of the candidates was made by scatter diagram.

When a single variate was to be predicted from a sing predictor, linear predicting equation : $y=a+bx$ was worked ou

from the original data by the usual statistical method of Least Squares and the residual sum of squares gave a measure of accuracy of the worked out predicting formula. Test of Independence of the criterion score on the predictor was also carried out.

The data collected of the successive years thus gave a number of such regression equations. Therefore, it was necessary to investigate whether the accuracy with which these prediction formulae were used, changed from year to year and this involved the test of equality of residual variances by applying Bartletts' test for "Homogeneity of Variances". When the above test proved the equality of yearly residual variances, the next problem was to see whether the same prediction formula could be applied for various years. This at once led to two types of tests : Tests of equality of a's and b's over different years by the technique of "Analysis of Variance."

When a single variate was to be predicted from several predictors, a predicting linear equation in the predictors was set up by the usual method of Multiple Correlation Analysis and the regression co-efficients were estimated by the method of Least Squares. Test for Zero Multiple Correlation was carried out to test if the predictors were of any use at all. In some cases, the use of extra predictors was also tested for significance.

When more than one variable were to be predicted from the several predictors, separate linear regression equations were fitted by the method of Least Squares. The test of significance was performed by computing Wilk's statistic and defined as determinant of the residual variance—covariance matrix to the determinant of the original variance—covariance matrix and taking

$$v = -\left(n - \frac{p+q+1}{2}\right)\log_e 10 \times \log \text{L} \text{, where } n = (\text{N}-1),$$

p=correlated variables and with $(p \times q)$ $d.f.$

It was also investigated whether the inclusion of additional predictors improved the accuracy of prediction or not. The following test was applied which consisted in computing the ratio L, of the determinant of the variance—co-variance matrix of residuals of the predicted scores from their regressions on all the predictors (including additional ones) to the determinant of the variance-covariance matrix of residuals of the predicted scores from the regression of predictors (excluding additional ones) and then taking

$$v = -\left(n - \frac{p+q+1}{2}\right) \log_e 10 \times \log \text{L} \text{; where } n = -(\text{N}-4),$$

p=number of predictive variables and q=number of extra-predictors as an approximate chi-square with $(p \times q)$ $d.f.$

Apart from the above statistical analyses and also where such analyses were not possible, mean and standard deriation of marks were only computed and inferences drawn simply by observing the graphical representation of distribution and the trend of marks of different years. Prediction of Degree examination marks on different levels of University Entrance examination marks was also encountered in a few instances.

Factorial analysis has not been employed as a technique of prediction in the present study, for the simple reason that from an ordinary essay type test, although it is true that different factors involved in the test may be found out, it is not possible to discern which one is which, and the comparison of factors between tests is also not possible, as the factors are unknown, and as different tests of educational attainments may give different weightage of factors at different times, for these are not framed to involve only certain factors as psychological tests are.

The ultimate objective of such a study is firstly, to furnish a measuring instrument for predicting success in the first degree examination in the Faculties of Arts and Science in the University of Delhi and secondly, to find aids in the educational guidance of students of the State of Delhi at the secondary stage of education.

The ultimate objectives can only be achieved through the fulfilment of proximate ones, which in this case are to make valid and reliable statistical inferences from the study of marks gained by the students at the Higher Secondary examinations and the Qualifying examinations with their subsequent marks at the Degree examinations and also to find the relative influences of other variables like chronological age, school marks, teachers' estimates in the prediction of success at the degree examination.

Both an intensive and extensive study relating to any subject needs a proper delimitation of the problem. Thus the present investigation proposes to ascertain the following:

First comes the topic "Prognostic Value of the University Entrance Examination Composite Mark". In the prevailing domain of Indian education, one finds that "numerical marking" of examination papers is the order of the day, though time and again statements are being made from high educational quarters commending the importance and usefulness of adopting "symbolic marking" with regard to the assessment of individuals in all the different stages of education. The former method of marking has led to the significance of a composite score in any examination. It assumes its great role by placing a candidate either in the list of passes or failures and it is also responsible for placing a successful candidate in a definite class: first, second or third. Over and above, it also operates as a selective factor for admission to the different

degree courses at the University of Delhi. At this stage it is, therefore, necessary to refer to the composite mark of the university entrance examination to find its efficacy as an index of the candidates' future educational success at the degree examinations of the Arts and Science Faculties. In the present context, the following problems were dealt with:

1. University Entrance Examination Composite Score and Pass Degree Success in Arts and Science.

2. University Entrance Examination Composite Score and Honours Degree Success in Arts and Science.

3. Different levels of University Entrance Examination Composite Score and Degree Success.

4. Awards of Three Divisions of the Successful Candidates at the Higher Secondary Examination and their respective degree Success.

Second, comes the "Efficiency of University Entrance Examination marks in English, Modern Indian Language and Mathematics in predicting the Degree Success of a Candidate." Prognosis from the result in one subject is more uncertain than prognosis from that of a group of subjects. It is not only believed but it has been tested and proved that academic success does not rest on one single mental factor alone, but on several ones. Therefore, it is futile to make an attempt to find out the prognostic value of each subject score separately. But in the present study an attempt has been made to find out the prognostic value of English, Modern Indian Language and Mathematics scores, ignoring other subjects, in forecasting degree success of a candidate and to know how much of a candidate's linguistic or mathematical ability acquired at the end of secondary education, as measured by either of the university entrance examinations, contributes to his future success in the degree examination either in the same subject or in general scholarship. It is through a language that one expresses his thoughts and ideas with the help of paper and pencil. A clear, logical and lucid expression no doubt reveals a person's high standard of clarity of thought. A muddled expression is nothing but a conglomeration of haphazard ideas. In Delhi, in the degree examination, English is the medium of examination. Thus, an English score of any university entrance examination may be found a better predictor than any Modern Indian Language score in estimating the future status of candidates in general scholarship. An honest saying about Mathematics is that if it is taught on proper lines in school, it develops in children the scientific method of reasoning. Therefore, the question is: Can a mathematics score be an honest predictor of a candidate's degree success in Arts or in Science? It is considered by the investigator that the above two abilities, linguistic and mathematical,

apart from others, exercise a great hold on the university success of a candidate. The first problem is: Is it so? The second is: If so, how much? With regard to the above problem the following three were discussed:

1. University Entrance Examination English Score and Degree Success.

2. University Entrance Examination Modern Indian Language Score and Degree Success.

3. University Entrance Examination Mathematics Score and Degree Success.

Third comes the "Inter-relationships Between Subjects," firstly, to find out what subject combinations at the university level are taken by the students; secondly, how should the different combinations of subjects be chosen in arts and science courses at the university from the present combinations of subjects taken at school. The present problem dealt with the following:

1. Prediction in Individual Subjects at the University.

2. Prediction in Non-school Subjects, at the University.

3. Inter-correlations between Subjects at the Degree examinations of Arts and Science.

4. Prediction in Honours subjects at the University.

"Comparative Study of Different Groups of Students" comes fourth in order of discussion with the following sub-heads:

1. Social sciences, Natural-sciences and Commercial Groups at the Higher Secondary Examination.

2. Arts and Science Groups and their Respective Success in the Degree Examination.

3. Men and Women candidates and their success in the Degree Examination.

4. The Success of the Distinction Holders of the Higher Secondary Examination in the Degree Examination.

5. Who Fail in the Degree examination?

6. Higher Secondary and Qualifying Candidates and their Success in the Degree Examination.

The fifth major problem under discussion is—"Other additional predictive measures apart from University Entrance examination score in forecasting Degree Success of Candidates." (1) Chronological Age, (2) Teacher's Estimates and (3) School marks were taken as three such additional predictive measures.

Analysis of Results

University Entrance Examination Composite Score

1. Students gaining 60 per cent or above at the Higher Secondary examination were a very good academic risk, the percentage of failures over four succesive years* being 2.72. Students gaining between 45 per cent and 59 per cent were a good academic risk, the percentage of failures being 21.46. For students obtaining less than 45 per cent in the Higher Secondary examination the chance of passing was less than that of failing in the Degree examinations, the percentage of failures being 58.99.

2. When 508 Higher Secondary candidates of 1949 who immediately proceeded to the degree courses were studied in detail, it was found that the mean values of the composite scores in the Higher Secondary examination of the First, Second and Third Class Honours Degree students were in the descending order of magnitude, 60.29, 55.12 and 51.80 with their respective sd's of 5.97, 6 73 and 5.29. There was not much appreciable difference in the accomplishment at the Higher Secondary examination between the two groups of students: those who obtained Pass Degree and those who failed in the Honours. Degree examination. The mean values of their Higher Secondary examination composite scores were 48.36 and 49 88 with sd's 3.50 and 4.65 respectively. Those who failed in the subsidiary subject in the Honours Degree examination scored much higher than the above students; their mean score being 51.21. Candidates who passed the Pass Degree examination with distinction obtained 59.66 as mean score in the Higher Secondary examination. The average mark in the Higher Secondary examination of the passed candidates was higher than that of the failed ones: the mean values being 48.89 (sd 5 48) and 45 22 (sd 5.35) respectively. Those candidates who were allowed to appear in the compartmental examination scored higher than the Degree examination failures. The mean values of the Higher Secondary examination composite scores of the absentees and incomplete ones lay between 48.50 and 58.50.

3. When B.A (Pass) and B.Sc. (Pass) Degree examination composite scores were compared with the Higher Secondary examination composite score, the two sets of r's over different years were found homogeneous and the averages were .47 and .30 respectively. The correlation co-efficient between Qualifying examination composite score and B.A. (Pass) Degree examination composite score fluctuated yearly, though they proved to be statistically significant and the average r between B.Sc. (Pass)

*When data of different years were compared, the data for the years 1944 and 1945 were excluded on account of different examination conditions that prevailed then.

Degree examination composite score and Qualifying examination composite scores over different years was .48.

4. There was no clear evidence that the Honours Degree marks in all the different subjects increased or decreased with the rise or fall in the University Entrance examination composite scores, but it was noticeable that among those who scored between 40 and 44 per cent in the aggregate in the University Entrance examination of 1949, the majority of them, say 70 per cent, failed to do well in the Honours Degree examination of 1952 Regression equations of all the Honours Degree marks in different subjects on Higher Secondary examination composite scores could not be set up as the number of candidates offering some of the Honours subjects was too restricted. Correlation co-efficients between Higher Secondary examination composite scores and Honours. Degree examination scores in Commerce and Economics proved to be statistically significant, but proved otherwise in Physics and Chemistry ; but the number of candidates involved in the latter was less than those in the former. Again, when separate regression equations of marks in Commerce and Economics were set up on two variables, namely, Higher Secondary English and Commerce or Economics scores, they proved to be more useful than regression equations on three variables : Higher Secondary English, Commerce or Economics and composite scores.

University Entrance Examination English Score :

5. Results on prediction in individual subjects indicated that the Higher Secondary examination score in English had the highest prognostic value (average r.57) in estimating University examination marks in the same subject. The rest of the following subjects were in the following order : Mathematics (average r.50) ; sanskirt (average r.48), Physics and Chemistry (average r.41), and Commerce (average r.39) over different years. The correlation coefficients between other subjects of the Higher Secondary and Degree examinations were found to be fluctuating each year.

6. It was of some interest to know whether the Degree examination English score could be predicted from paper wise marks in English of the University Entrance examination and what weight each paper contributed to such prediction. It was proved that the marks in these papers (Grammar and Composition, Prose, and Poetry and Translation) were needed for greater accuracy in prediction than either marks in one or two papers. R was found to be 510. When it was examined whether it was possible to predict a student's mark in English (Paper I, Paper II and Paper III) at the B.A. (Pass) Degree examination from a previous knowledge of his marks in English Paper I, Paper II and Paper III at the Higher Secondary examination, it was noticed that Paper I proved to be the least valuable of the three variables to

be used for prediction purposes. When marks of two papers (Grammar and Composition, and Prose and Poetry) of the Qualifying examination were considered to predict the B.A. (Pass) Degree examination score in English, it was found that Paper I proved abetter predictor of the two and R was found to be .331. Similarly when separate regression equations were set up of marks in three B.A. (Pass) Degree examination papers on marks in two papers of the Qualifying examination, again Paper I proved to be the better of the two predictors. It was then investigated if the inclusion of a student's scores in Modern Indian Languages (Paper I and Paper II) in addition to the marks in three English Papers would increase the accuracy of prediction of B.A. (Pass) Degree examination scores in English (paperwise). Though the additional predictors proved useful in predicting such it was advisable not to use the same as the marks in Paper II gave a negative index in the regression equations. It was better to exclude the extra-predictors and lessen the burden of computation.

7. The correlation coefficient between the Higher Secondary examination score in English and the B.A. (Pass) and B.Sc. (Pass) Degree examination composite score (excluding marks in English were .42 and .17 respectively and the r between the Qualifying examination score in English and the B.A. (Pass) Degree examination composite score (excluding marks in English) was .35 and in the case of B.Sc. (Pass), r proved to be negative. The students who obtained less than 40 per cent in the Higher Secondary examination, mostly failed in the Degree examination. Scores in Mathematics and science subjects in the Honours Degree examination showed no tendency at all to increase or decrease with the rise or fall in English marks at the University Entrance examination. When separate regression equations were set up of the Honours Degree examination marks in Commerce and in Economics on the Higher Secondary examination marks in Commerce and English or Economics and English, it was proved that English and Commerce or English and Economics marks predicted Honours Degree examination marks better than either Higher Secondary examination marks in Commerce or Economics. But the Higher Secondary examination score in English did not prose useful in predicting any of the science subject scores or the scores in Mathematics at the degree level.

University Entrance Examination Modern Indian Language Score :

8. Correlation coefficients between the Higher Secondary examination score in Modern Indian Languages and the B A. (Pass) Degree examination composite score (excluding marks in Modern Indian Languages) was .28 and between the Qualifying examination score in Modern Indian Languages and the B A. (Pass) Degree examination composite score (excluding marks in Modern Indian Languages), was .19. The correlation between the Modern

Indian Language score and the B.Sc. (Pass) Degree examination composite score was not computed because most of the students offered History of Science and Scientific method in place of Modern Indian Languages in the B.Sc. (Pass) Degree examination.

University Entrance Examination Mathematics Score :

Higher Secondary examination score in Mathematics proved the best predictor of its own marks in the Degree examination. It was also found useful in predicting Degree examination Physics and to a little extent, Chemistry. It did not prove useful in predicting English scores at the degree level. As Mathematics was offered by a few students at the Arts Pass Degree examination, its relationship with other arts subjects could not be elucidated.

Inter-relationships between Subject Scores :

10. A non-school subject like Philosophy had an average *r* of .39 with the Higher Secondary examination score in English over different years. Other subjects like Politics and Political Science could not be compared with any subject at the Higher Secondary examination because the number of candidates offering the same subjects at the Degree examination was less than 5.

11. Inter-correlations between arts and science subjects at the degree level showed that there was a close relationship in most of the arts subjects. The same was true of the science subjects. But success or failure in arts subjects was not followed by the same in the science subjects.

Attainment of Different Groups of Students :

12. In three out of four years, the achievement of the social sciences, commerce and natural science groups significantly differed from one another.

13. When the Arts and Science students of the Degree examinations were compared, the following conclusions were drawn :

(a) The composite score of B.A. (Pass) candidates was better predicted than that of B.Sc. (Pass) candidates from the Higher Secondary examination composite score.

(b) Arts and Science students who had scored the same average marks in the University Entrance examination differed in their achievement in the Arts and Science Pass Degree examinations.

(c) There was an appreciable difference in the accomplishment of the Science Honours students in both the University Entrance examinations. All Physics Honours students had secured

60 per cent, and Chemistry Honours students, 50 per cent, in the aggregate in both the University Entrance examinations. But Botany and Zoology Honours the students were drawn from the lower strata of the University Entrance examination composite score.

(d) At the degree level the science students scored higher average marks than the arts students in the Pass Degree examinations in all the years but the variability in marks of the former group was found to be higher than that of the latter group in three out of four years. The accomplishment of students in Physics and Chemistry at the Honours Degree examinations of different years was definitely better than that of students in other science and arts subjects except in Sanskrit and Philosophy.

14. Sex differences existed at the Higher Secondary and B.A. (Pass) degree levels. On account of the restricted number of women candidates in other categories, it was not possible to carry out the investigation on the above line.

15. The Higher Secondary examination distinction holders, as a whole, were a small group whose ability was higher than the other successful candidates at the Higher Secondary examination. It was also noticed that their interests and ability in specific subjects did not go hand in hand.

16. The students who failed in the Degree examinations, either in the aggregate or in individual subjects, scored below 45 per cent in the same subject or in the aggregate in the Higher Secondary examination.

17 It has been seen that during four successive years from 1946 to 1949, 503, 599, 744 and 945 students passed the Higher Secondary examination. Out of these, 45 per cent, 50 per cent, 54 per cent and 53 per cent completed the degree courses of the University. Of these 71.2 per cent, 75.6 per cent, 79.1 per cent and 78 per cent obtained some types of degree after the study of three regular years. But out of the successful candidates of the Qualifying examinations who were admitted to the degree courses 54 per cent, 62.3 per cent, 73.3 per cent and 73 per cent were awarded some types of degree after three years' regular study. Thus from the above, one is able to forecast that of the regular Higher Secondary students, 70 per cent would be successful in obtaining some types of degree in three years but it was difficult to estimate this in the case of the Qualifying candidates. When the marks of the Pass Degree examinations in Arts and Science were graded in class intervals of five and those of the Honours Degree examinations in Arts and Science were categorised into First, Second, Third Class etc., with their respective Higher Secondary or Qualifying examination mean scores, it was made clear by the tables that the standard of marking varied in the two University Entrance examinations. It was noted that

the candidates had to score more in the Higher Secondary examination than in the Qualifying examination in order to obtain the same mean score in the Degree examination.

School Marks :

18. The composite score of the Tenth Class Promotion Examination in schools, 1945, proved to be a useful predictor of the composite score in the Higher Secondory examination, 1946. It was not possible to work out a single regression equation of Higher Secondary examination composite scores on all the combined school scores either in Arts or Science. The composite score in the Higher Secondary examination of 1945 proved useful predictor of the composite score in the Pass Degree examination in Arts, of 1949, though the forecasting efficiency coefficient was low. An additional predictor i.e. school examination composite score, together with the Higher Secondary examination composite score did not improve the above prediction. It was not possible to work out any regression equation of Honours and B.Sc. (Pass) Degree candidates as the number of students in each category was small.

Chronological Age :

19. Age proved a profitable additional profiitable with the Higher Secondary examination composite score in estimating success in the Degree examination. The average ages at entrance to the University of students who graduated with the B.A. (Pass), B.Sc. (Pass), B.A. (Hons.) and B.Sc. (Hons.) Degrees after three years' study were 18 years 7 months, 17 years 3 months, 17 years 1 month and 17 years respectively. The mean composite scores of the candidates between the ages 17 and 18.11/12 seemed to be steady both at the Higher Secondary and Degree examinations. The mean composite marks of candidates of 19 years and above were on the average less in percentage than those of the candidates between 17 and 18.11/12 years of age at the Higher Secondary examination as well as at the Degree examination. In many cases, the mean composite marks of candidates below the age of 16 years were found to be very high at the Higher Secondary examination and low at the Degree examination which seems to speaks of the instability in the attainment of the younger students at the college level.

Teacher's Estimates:

20. College Teachers' ratings of their studenıs were in conformity with their Honours Degree examination results, but in the case of Pass Students, who were rated " average and "low" respectively in most of the traits by their teachers the mean

values of composite scores in the Degree examination in most of the cases showed otherwise. All the tables on each trait indicated that ratings on each trait were better in the case of Honours Students than the pass ones. This may be attributed to the closer relationship between the teacher and the taught. In order to find out which of the traits were more prominently present in the students than others, cumulative scores on each trait were computed. "Drive for Graduation" scored the highest and "Industry" stood second in order among the Pass students and "Mental Capacity" and "Industry" scored the highest among the Honours students. From the teacher's ratings, it was clear that there existed a great gulf between the Honours and Pass tudents, as the cumulative scores on each frait of Honours students were much higher than those of the Pass students.

Conclusions and Educational Considerations:

Though the present study was concerned with the data of six successive years, yet the number of women candidates were not sufficiently large in any year. The students offering different subject combinations in the Pass Degree examinations of Arts and Science were also very few in number with the exception of candidates in one or two combinations. Again, the number of students appearing for the Honours Degree examination was also limited in almost all the subjects, though not in all years. When students were divided into different age levels or different grades of marks they again presented a poor number. No proper and adequate statistical procedure was possible in such cases and the conclusions drawn were based on insufficient and limited data.

It was one of the tentative hypotheses of the investigator that a combination of school marks, school teachers' remarks and University entrance examination scores would predict the future status of students at the Degree examinations with greater accuracy than merely one predictor, namely the University Entrance examination score. Unfortunately, all the schools could not provide marks of all the students for all the three years, and also it is not the tradition in schools to record teachers' estimates of their students.

On the findings of the present study the following statements may, however, be made:

1. That the choice and selection of optional subjects at the university by the students obtaining less than 45 per cent in the aggregate or in individual subjects in the University Entrance examination should be made with great caution and they should be advised to offer more or less allied subjects and those subjects that were taken at school. It would also be of great value, if

they could be placed under the care of expert guide or tutor at college.

2. That though at present the University of Delhi has laid down the rule that "for admission to the Honours courses, students who have passed the Higher Secondary examination of the Board of Higher Secondary Education or any examination recognised as equivalent thereto, or the Qualifying examination conducted by the University of Delhi must have secured at least 45 per cent of the total marks of the examination or 50 per cent n the subject offered for Honours", yet each case must be decided on its own merit.

3. That the standard of marking in the Higher Secondary and Qualifying examination varied considerably, and further research is therefore needed in the field in order to find the "equalisation of marks", as this would help a great deal at the time of selection of the successful candidates of the two above examinations for the different degree courses of the University of Delhi.

4. That the scores in English can be used as an additional selective factor with the score in that subject which is to be offered in the Arts Honours Degree courses except in the case of Mathematics, Hindi and Sanskrit. The most noteworthy demand is that those who wish to take up Honours in English must secure a high percentage of marks (not less than 60 per cent) in the same at the University Entrance examination.

5. That for selection to the Honours Degree courses in Science, the University Entrance examination scores in science subjects are of primary importance.

6. That though the present study under-estimates the value of the Modern Indian Language score in predicating scores in other subjects in the Degree examinations, yet it can be profitably employed at the time of the selection of students for Honours Degree courses in Hindi and Sanskrit.

7. That the University Entrance examination Mathematics score can only be usefully employed to predict its own mark and that of Physics in the Pass and Honours Degree examinations.

8. That chronological age can also be used as a useful adjunct to other predictive measures and the minimum University Entrance requirement may be regarded as 17 years.

9. That though the school mark was not found to be useful in predicting the level of success at the Degree examination yet the average school marks of three years should be regarded as one of the principal criteria for admission to the University, specially of the border-line candidates.

10. That collective teachers' estimates from the school would also be of great value for the purpose of such prediction.

11. That scrutiny into the marks of the Higher Secondary examination distinction holders and their choice of subjects and results in the Degree examinations together with the failures at the same examination indicated that there is a great need for guidance services at school and college.

Though the present study slightly underestimated the prognostic value of the Higher Secondary examination, yet the above can not be interpreted as being a condemnation of the Higher Secondary examination because any unreliability of marking at the Degree examination might have also lowered the prognostic value of the Higher Secondary examination. Therefore, it would not be right to lay the whole blame on the Higher Secondary examination as many other factors might have also influenced the low correlation between the two : such as preliminary screening of the Higher Secondary examination, variation in the quality of teaching in the XI class in the schools and variation in the quality of lectures in the colleges, the different combinations of subjects taken by the individual students at the university, the change of motivation on the part of the candidate and the change of emphasis in a particular subject.

Although the present research tended to underestimate the prognostic value of the Higher Secondary examination, it has been profitable in drawing attention to many of its weaknesses. The Higher Secondary examination results have proved "an inadequate guide" for selection at the university from the border-line group of students. For these students other aids, like school records and psychological tests (if possible), are necessary and invaluable. The present study has also proved that in many cases a careful consideration of individual cases might have given a better prediction than the results obtained by statistical calculations, because all the relevant data cannot be placed for statistical treatment. In such cases, the 'actuarial method' and individual case study might have given better prognosis.

The above conclusions bring us to the final point that no selection can be considered utopian, because it must be recognised that a certain percentage of failures is a necessary feature of the examination system and it is inherent in the nature of examinations that some students must fail. Again, whatever may be the method of selection many factors, both academic and non-academic, may cause unpredictable failures.

RECOMMENDATIONS

Necessity of an External Examination at the end of Secondary Education

It is said that originally examinations were started to test whether a candidate had the necessary qualification to practice a craft or a profession. Now they are put to various uses, such as "to arrange candidates in order of merit, to test proficiency in a subject or in more subjects and following these, to test general culture and even to test the efficiency of schools."

However, a distinction is now being made between professional and non-professional examinations. In the former, there is a definite goal in view, while the latter marks the completion of a course or merely serves as a guide to further education. It may, however, consist of a School Leaving Certificate examination, Entrance examination for professional courses and a University Entrance examination such as the Higher Secondary examination of Delhi.

But it has been often remarked against an external examination that "people are not clear about its reliability and validity, sometimes not even of its purpose, or the meaning of the certificates conferred in connection therewith." It is again criticised that it is not possible to compare the suitability of the candidates by means of heterogenous aggregate marks assigned by the different examiners in different subjects. Thus, people now-a-days disapprove of such an examination and regard its influence on school work as vicious, though it still continues to select and classify students after they have gone through a course.

But it is also said that "the examination system has acquired an immense importance in all civilized states and has become an essential factor in social organisation since the selection of individuals to filful various functions in the state, as well as for the great categories of social occupation, is largely determined by examinations." It is difficult to deny the above facts. Therefore, if the above situations are considered it may be said that the external examination is not a necessary evil but an essential part of education. It serves not only as a mobilizing force in it but also provides a means of testing its outcome. It equally affects teachers, pupils, textbooks and even the administration of a school. By providing well defined goals it stimulates students to achieve that in a given time. It also gives them a hallmark recognised by all. To teachers, it acts as a stimulus by making their purpose clear, their work precise and their methods of teaching definite. Again, it sets a common standard so that all the schools may be

compared uniformly. All the above the indirectly affects the vocabulary, content and other requisites of a textbook and above all the administration of a school. Such an examination, namely the Higher Secondary examination is linked with a definite course of study leading up to it and also with subsequent activity available to the suceessful student. Here intelligence or aptitude tests are of no use though they provide a means of classifying students according to their abilities in certain directions. No doubt they facilitate further activity but "they have no concern with the previous course of preparation and in fact presuppose that there has been no such courses."

But in such circumstances many prefer an internal examination to an external one. One of the fundamental criticisms of the present external examination is that "it exerts a cramping influence on the teachers," who are prevented by it from teaching what they would otherwise teach. But it may also be said of an internal examination that much will depend upon the whims of an individual teacher as a good one will generally like to devote his whole time to those aspects of the subject about which he knows most, and may from a wrong judgment about the work of his pupils. It will also not be possible to select students from different schools for future education by direct or fair competition as much will rest on the recommendations of headmasters and the students of small schools will often suffer in such circumstances. It will also fail to fix common standards in different schools and thus will not act as a guide and stimulus to teachers and students alike. Hence, the necessity of an external examination at the end of secondary education. Nevertheless it needs modification, in view of its limitations.

Changes Needed in Higher Secondary and Degree Examinations.

The present study indicates certain possible lines of reform in the existing system. In order to have a high positive relationship between these two examinations, the former has to be run jointly by representatives of teachers of the schools examined, assisted by representatives of those who will be responsible for the subsequent education of the successful candidates. It has to be planned and controlled by an examining body, consisting of the representatives of the university, of the teachers of the schools examined, of the local educational authorities and of authorities of different professional courses. Secondly, a more uniform system of assigning marks must be worked out. Examination marks should conform to a given frequency curve and examiners should be expected to furnish a set of marks roughly conforming to the prescribed pattern and if any adjustment is required the merit of each particular candidate has to be scrutinised. The next guiding principle is that the "Quartile" and the "Median" may be fixed for the examination, if possible. In this case the marks of the

examinations of ten years may be considered. From the data of ten years, say, one can obtain the mean and standard deviation of the marks allotted to the candidates for each year in a particular subject. Regarding these as ten samples and knowing the number in each sample, one can form a pooled estimate of the mean and standard deviation of a supposed population of candidates. Then this mean and standard deviation may be regarded as a standard of reference.

To decide the borderline cases in the Higher Secondary examination, the examining body should employ average Higher Secondary school examination marks (obtained during three years at school), and in the Degree examination, the average college examination marks (obtained during three years at college) either subject wise or aggregate, as the case may be.

Next, it may also be pointed out that both the examinations need be more practical as these consist mainly of written work. Every subject in the curriculum has its "practical side".

The minimum mark required to pass the Higher Secondary examination is 33 per cent in each subject and in a science subject the pass percentage is 33 per cent in the written and in the aggregate and 25 per cent in the practical examination. The minimum marks required for passing the B.A. (Pass) Degree examination are 40 per cent in English, 40 per cent in Modern Indian Languages and 33 per cent in each of the other subjects and 40 per cent in the aggregate. The minimum marks required for passing the B.Sc. (Pass) Degree examination are 33 percent in English, 33 per cent in Modern Indian Languages or History of Science and Scientific Method, 40 per cent in each of the science subjects, 40 per cent in the practical examination and 40 per cent in the aggregate. It is at once shown clearly by that equal weight is given in all subjects both in the arts and science courses at the Higher Secondary examination, but it is not so at the degree level. The present recommendation is to employ and maintain a uniform standard of marking at the two levels : secondary and university. If not, there is a fear of education being "top-heavy".

Lastly, it may be suggested that such examination marks should periodically be subjected to the criticism of a professional statistician.

Changes Needed in Higher Secondary and Degree Courses

On the basis of the present study, a suggestion is necessary about the composition of the two different courses. In order to have a closer relationship between the two, the courses followed in each subject for the Higher Secondary examination should be

well integrated. Again, there must be continuity and no gap in between the Higher Secondary and the Degree courses either relating to the arts or science subjects. A general plan proposed for dealing with the courses at the higher secondary level is to set up a series of subject councils, one for each main subject, to be vested with the power of co-ordinating the two courses and their adaptation to the present needs. The subject councils should be composed of representatives of higher secondary school subject teachers, university subject teachers, members of the inspectorate, representatives of training colleges for teachers and of the Examining Body. The subject council should formulate in general and in detailed terms standard courses introducing new items with the change of time and be co-operative with the publishers and authors in bringing out authoritative textbooks, in order to reduce duplication of textbooks. Such councils should invite the co-operation of teachers to produce the collective wisdom of teachers in a single volume, yet without discouraging the publication of original contributions. The subject councils should also be responsible to publish educational forums and periodicals to expound their policy. In no way will this lead to the centralization of the examination system but help in the reorganisation of the examination adaptable to local needs and also help in the continuity of work between schools and colleges.

Changes Needed in Schools and Colleges.

Now it shall be considered if any changes are needed in schools and colleges in order that external examinations may be adopted to deal effectively with the needs that are in demand.

Admission to secondary schools has never been selective in this country. But with the introduction of a compulsory and universal system of primary education, there will an be unprecedented increase in the number of pupils seeking admission to secondary schools as well as to the university. This will necessitate some positive types of tests by which the abilities and aptitudes of the pupils can be ascertained with sufficient precision. It is most opportune to mention here the role of training colleges for teachers in this connection. First, they should train personnel who can counsel and give educational and vocational guidance in schools and colleges. Secondly, training colleges should supply them with tools necessary for their work. These include tests of intelligence, aptitude, attainment, interests, and personality. Thirdly, they should encourage research on suitable methods of recording the achievement and personal qualities of students at school and college.

Prediction at the secondary or the university level will of course need careful scrutiny of a candidate's previous school record, together with other important data. Thus, schools should begin

to maintain proper and systematic records of their evaluation of students as the candidates pass through each class and of the students genuine chronological age. Secondly, all schools may use as far as possible a standard record form.

It has been seen while collecting data from schools that very few schools have any adequate records of students covering a period of years. Even records of daily attendances and scholarships are many times inefficiently recorded and more often destroyed.

In addition to the above, if at least the annual examination in each higher secondary school is made to conform to the higher secondary examination it will enable one to make a comparative and a relative study of school and higher secondary examination marks. A uniform mode of marking as recommended earlier can also be enforced in schools even at present, as all the teachers intended for secondary schools are required to follow and complete a course ef Elementary Statistics in most of the training colleges for teachers. What is said of the changes needed in schools is equally true of those needed in colleges.

It seems reasonable to assume that a very high rate of mortality and elimination which now exists at the degree level may be considerably reduced by a good guidance programme at school and college. Teaching pupils to study the higher secondary course is the best preparation for study of subsequent courses. Secondly, secondary school teachers have to undertake definitely "specific subject guidance" in their schools for pupils planning to enter college.

It is also convincing that there can be no substantial progress in the matter of prediction, unless the standard of instruction both in school and college is appreciably raised and instruction in different subjects at both levels is of a sufficiently high order. The primary requisite to secure this is that conditions of service of teachers should be improved in practice and not in paper and pencil alone and there should be a definite ratio fixed between the students taught and the teacher. The tutorial and seminar system in small groups should be adopted by all colleges and the number of lectures reduced in order that "students may learn better how to teach themselves". The lecture method has to be occasionally supplemented by the seminar type of instruction in college.

Additional provision for teaching English at the initial stage of the university will be necessary for the students backward in English so long as English remains the medium of instruction and examination in the university, as these students may fail to grasp the lecture on account of their inadequate knowledge of the English language.

Before concluding this section something may be said here about the attitude of teachers in schools and colleges towards research work in education. They look on research workers as mere intruders, and regard their efforts as encroachment. They think that research is nothing but the scrutiny of the personal efficacy of teachers and their institutions, and therefore avoid helping research workers in collecting data for their projects. They should be made 'research conscious' and optimistic in their views. They should be reoriented to think that research would make their lot better and their teaching easier and more fruitful. If they refuse to co-operate with research workers, no research in the field of education will be successful and no redress is thus possible,

Selection Procedure at the University for the Immediate Present :

In India, selection procedures at the university stage which have never been subjected to any rigorous examination are now emerging somewhat haphazardly due firstly to the various types of courses that are introduced at the university at the present day and secondly to the large infiltration of students to the university. But such procedures are neither regular features nor are they based on the scientific study of the problem. It is only recently that conscious efforts are being made to improve and replace the older techniques of selection. The survey of selection procedures used in university education outside India indicates that no single solution or technique is likely to be found universally satisfactory even in the same university because of the varying problems arising out of widely differing courses.

The selection of freshers in any college should not be done in a haphazard manner with the admission period alloted to two to three days. Such a procedure is unwise and is undertaken when a college takes the view "let time take its own course." This cannot be done in an off-hand manner relying only on marks. In the selection of students more emphasis has to be laid on the selection of subjects by the students than on mere admission of students to the university. But some conscious effort has to be made even at this odd juncture for the guidance of students into proper degree courses with suitable subject combinations with the following data in hand : school marks, teachers' estimates, age and higher secondary examination marks. But some educationists are against the use of school marks unless they are made comparable from school to school, because the standard and scatter of marks vary from teacher to teacher and from school to school. Now the question is how to make the standard and scatter of marks in one set of marks the same as the standard and scatter in another set. This is possible by the method of "Scaling Teachers' Marks and Estimates", as recommended by McClelland.

The following selection programme with its various steps may, however, be considered for its suitability and practical utility.

First, applications are to be invited from candidates who fulfil all the requirements of a particular college; second, the college office is to make different lists of candidates offering different subject combinations for the Pass Degree examination and different subjects for the Honours Degree examination; third, members of the teaching staff should take up the selection of students. Several committees may be formed of the teachers to carry out this selection. At first, the candidates are to be divided into three groups: candidates with a wise choice of subjects, candidates with a definitely unwise choice of subjects, and candidates with not a very wise choice of subjects. Such a selection programme should be undertaken at least one week before the opening of the college session. The names of the candidates with the right choice of subjects may be announced as provisionally admitted to the college with their respective combinations of subjects, on the re-opening day of the college. The students of the other two groups need to be interviewed to know their preferences and likes and dislikes of subjects. At the time of entrance to the university, the expressed preferences of an individual can be used to increase materially the accuracy of the prediction for future academic success. The first week of the college may be known as "Freshers' Week". Interviews will be carried on during this week and teachers with the help of the candidates will be now in a position to guide them to the right degree courses with proper subject combinations. When students are adamant, their parents may be consulted. The interviews and the students' orientation to the new omit college should go hand in hand. This should be in the form of talks by the principal, heads of departments of different subjects, discussions, etc. At the end of the first week, a provisional list of candidates following different combinations of subjects or offering different subjects for the Honours Degree examination may be prepared. But students for one full month may be allowed to attend any additional lecture classes apart from theirs if they wish to do so to further enable them to make their final decision or choice of subjects. After one month the college begins its work with a permanent enrolment list of freshers for the Pass and Honours Degree courses in the Faculties of Arts and Science. This stretch of one month is very essential from the psychological and academic points of view. This period is necessary to the freshers to gain social adaptability and normal bearing. Over and above, this experimental month will also obviate later changes of subjects and dropping out of candidates from college. Though the above procedure may sound as an additional task and responsibility imposed on the college teachers for a few weeks, yet it will help them in the long run in their teaching and in its outcome. All the Honours candidates must also be

kept on probation for three months, in order to test their interest, aptitude, and achievement in the subject concerned. Subsidiary subjects should also be chosen according to the second preference and attainment of the student, because it has been seen that a student failing in the subsidiary subject loses a 'class' in his Honours degree. Also, if he falls back to the Pass Degree course after three months he may not feel lost in any way.

Lastly, it may be mentioned that no Honours subject may be graded from the highest to the lowest, say, from Physics, Chemistry, Zoology, Botany to Anthropology. At present, good students are only allowed to offer particular subjects not always because they have a special aptitude for it, but because of a limited number of seats, and of laboratory equipment, etc. On the part of the students, too, there is a craze for certain subjects for their prestige, ease of getting a job and other such considerations. But it must be noted that if all the First Class students are drawn to Physics, Second Class students to Chemistry, and so on, then all the Third Class students will be drawn to Anthropology. If each year such a condition prevails, then there is every chance of a branch of study being totally neglected. It may even lead to a national crisis. If every year only Third Class students are recruited for a typical branch of study, in some years to come there will be no experts in the field. The opposite may be the outcome, where every year First Class students are selected for a particular branch of study. This will lead to unemployment in the long run. It should be remembered that selection of candidates for any branch of study should not only depend on the individual himself, but the national needs must be considered hand in hand.

Need For a Full-fledged Selection Programme.

In conclusion, it must be brought out that there is an urgent need for research in this field of selection procedure, because of wastage and elimination in the university courses and also because of the fundamental need to make the best use of human resources particularly for technological occupations and education.

An essential requirement for the practical side of the problem is that the method of prediction must be fairly and reasonably easy, quick and accurate. It is desirable to employ all availble information which has any bearing upon prediction. But the question arises how to choose items of greatest value and combine them in a way as to give the greatest accuracy of prediction. It is perceptible to all that they are not equally valuable for the purposes and then the question arises in the words of Odell, "as how to weigh each, in other words how largely to let each other enter into the prediction made in order that it may be of reasonable degree of accuracy."

Therefore, a research team, consisting of the staff of the Training College for teachers, the staffs of the University Education and Psychology Departments and the Technical College staff should be initiated as soon as possible to begin work on the above lines. There is need to make mention again of its primary requisite—a voluminous treasure of prognostic literature.

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